418 Rec'd PCT/PTO 11 MAR 1999

FORM PTO-1390 (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 88724

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 09/254743

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP97/04987	September 11, 1997	September 11, 1996

TITLE OF INVENTION: COOLING COVER, COOLING COVER COMPONENTS AND COOLING TUBULAR ARMATURE

APPLICANT(S) FOR DO/EO/US: REINER WEBER; MICHAEL SCHWENDEMANN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [x] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [x] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. [x] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [x] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [x] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [x] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [x] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [x] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [x] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [x] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [x] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [x] Other items or information:
    International Search Report w/Engl. translation
    4 sheets informal drawings
    International Preliminary Examination Report (German)
    Engl. translation of Annexes to IPER
    Engl. translation of submission of 11/23/98 in response to IPER
    Amended claims 1-11 (German and English)

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
	PCT/EP97/04987	88724

17. [x] The following fees are submitted:

	CALCULATIONS PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):	
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $970.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $840.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $760.00	
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) $670.00	
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) $96.00	
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 840
Surcharge of $130.00 for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	33 - 20 =	13	X $18.00	$ 234
Independent claims	2 - 3 =		X $78.00	$
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $260.00	$
TOTAL OF ABOVE CALCULATIONS =				$ 1,074
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also by filed (Note 37 CFR 1.9, 1.27, 1.28).				$
SUBTOTAL =				$
Processing fee of $130.00 for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$
TOTAL NATIONAL FEE =				$ 1,074
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$
TOTAL FEES ENCLOSED =				$ 1,074
			Amount to be: refunded	$
			charged	$ 1,074

a. [ ] A check in the amount of $_____ to cover the above fees is enclosed.

b. [x] Please charge my Deposit Account No. 20-1430 in the amount of $ 1,074 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [x] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 20-1430. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

J. Georg Seka
Townsend and Townsend and Crew LLP
Two Embarcadero Center, 8th Fl.
San Francisco, CA 94111

SIGNATURE

J. Georg Seka
NAME

24,491
REGISTRATION NUMBER

Atty. Docket No. 88724

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

Applicant or Patentee: Reiner Weber; Michael Schwendemann
Application or Patent No.: 09/254,743
Filed or Issued: March 11, 1999
Title: COOLING COVER,COOLING COVER COMPONENTS AND COOLING TUBULAR ARMATURE

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office regarding the invention entitled COOLING COVER, COOLING COVER COMPONENTS AND COOLING TUBULAR ARMATURE described in:

[ ] the specification filed herewith.
[X] Application No 09/254,743, filed March 11, 1999.
[ ] Patent No. _____, issued _____.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey or license any rights in the invention is listed below:*

[ ] No such person, concern, or organization
[ ] Persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Name _____
Address _____
_____
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

Name _____
Address _____
_____
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Inventor: Reiner Weber	Name of Inventor: Michael Schwendemann	Name of Inventor:
Signature of Inventor	Signature of Inventor	Signature of Inventor
Date 4.05.99	Date: 4.05.99	Date:

SF 203573 v1

PATENT
Attorney Docket No.: 88724-0
Client Reference No.: W 2462 - R/sb

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. National Phase of:
PCT/EP97/04897 of

REINER WEBER, et al.

Application No.: Not yet assigned

Filed: Herewith

For: COOLING COVER, COOLING COVER COMPONENTS AND COOLING TUBULAR ARMATURE

Art Unit: Not yet assigned

PRELIMINARY AMENDMENT

San Francisco, CA 94111
March 11, 1999

Box PCT
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-referenced application, please enter the following amendments and remarks.

IN THE CLAIMS:

Applicants note that the claims under consideration are amended claims 1-11 (attached hereto) which were submitted with applicant's response letter of November 23, 1998 to the International Preliminary Examination report of July 12, 1998, in addition to original claims 12-33.

Claim 3 (twice amended), line 1, please delete "one of the preceding claims" and substitute therefor --claim 1--.

Claim 6 (twice amended), line 1, delete "one of the preceding claims" and substitute therefor --claim 1--.

Claim 9 (twice amended), line 1, delete "one of the claims 7 to 8" and substitute therefor --claim 7--.

Claim 10 (twice amended), line 1, delete "one of the claims 7 to 9" and substitute therefor --claim 7--.

Claim 11 (twice amended), line 1, delete "one of the claims 7 to 10" and substitute therefor --claim 7--.

Please cancel claims 12-16.

Claim 20, line 1, delete one of the claims 17 to 19" and substitute therefor --claim 17--.

Claim 21, line 1, delete one of the claims 17 to 19" and substitute therefor --claim 17--.

Claim 22, line 1, delete one of the claims 17 to 21" and substitute therefor --claim 17--.

Claim 23, line 1, delete one of the claims 17 to 22" and substitute therefor --claim 17--.

Claim 25, line 1, delete one of the claims 17 to 24" and substitute therefor --claim 17--.

Claim 26, line 1, delete one of the claims 17 to 24" and substitute therefor --claim 17--.

Claim 27, line 1, delete one of the preceding claims" and substitute therefor --claim 1--.

Claim 28, lines 1-2, delete one of the preceding claims" and substitute therefor --claim 1--.

Claim 29, lines 1-2, delete one of the preceding claims" and substitute therefor --claim 1--.

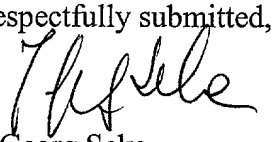
Claim 31, lines 1-2, delete one of the preceding claims" and substitute therefor --claim 1--.

REMARKS

The claims presently pending are claims 1-11 as amended in applicants' response to the International Preliminary Examination Report and claims 17-33 as originally filed.

Amendment is made to eliminate all multiple dependencies from the remaining claims, thereby avoiding the need to pay the multiple dependent surcharge.

Respectfully submitted,



J. Georg Seka
Reg. No. 24,491

TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, 8th Floor
San Francisco, California 94111-3834
Tel: (415) 576-0200
Fax: (415) 576-0300
JGS/tp
SF 203536 v1

Description

The present invention relates to a cooling ceiling consisting of cooling tube mats, in particular plastic cooling tube mats, which are attached or attachable to a bare ceiling, or to an existing ceiling, by means of a carrier system, and also relates to an element and to a cooling tube mat for use in such a cooling ceiling.

Cooling ceilings of the above-named kind are principally used, in known manner, in multiple stores, offices and larger buildings. The aim exists to cool the rooms, above all in summer and for this two different system are known in principle which offer an alternative to air conditioning. In air conditioning the room air is continually circulated and cooled to a preselectable temperature. Such air conditioning systems are relatively complicated, require regular servicing and as a rule cause noise and can lead to an undesired transmission of germs.

In a cooling ceiling of the initially named kind a liquid is transported with the aid of cooling tubes, i.e. of cooling mats, which serves for a cooling of the warm air which rises to the level of the ceiling and which then falls downwardly again as cold air. After a certain time the cooled temperature is so to say radiated downwardly. The advantage in comparison with customary air conditioning systems relates to almost service-free operation and cooling of the space without noise arising.

Known are on the one hand cooling ceilings consisting of cooling tubes which are delivered in mat form and are used in connection with metal ceilings.

Known is also the use of plastic cooling mats which are subsequently plastered over.

Despite the advantages of cooling ceilings the above-named system however also have disadvantages.

In the system in which the cooling mats and cooling pipes are used in connection with metal ceilings there is a high cooling loss upwardly; the cooling action which is to be achieved is, so to say, radiated upwardly to too great an extent.

In the second variant, in which the cooling mats are subsequently plastered over, the installation is tied to a greater degree to the constructional circumstances. Through the laying of cooling mats in plaster the danger also exists of condensation arising which has the consequence that the cover layer separates from the cooling mats, or tears, or that ugly spots arise. Moreover, in both the above-named systems hindering of the building progress and other works is unavoidable.

The object of the invention is to provide a cooling ceiling construction which has a high degree of efficiency in operation, which enables a very flexible building progress, offers many possibilities for lighting and installation, preferably achieves a fire protection of at least F 30 without the need to check the lower ceiling, can be installed in high rooms at the desired level, for example in old buildings, without additional lower ceilings, can be used as a carrier for sound insulating plasters or paints and enables a saving of the calculated cooling mat area to be achieved.

In order to satisfy this object provision is made in accordance with the invention in a cooling ceiling of the initially named kind, in a first variant, that a sandwich construction is provided with upper and lower dry building panels, in particular fire resistant dry building panels such as sandwich-type plaster board panels or gypsum fibre board panels which are spaced apart from one another by spacers to form shallow hollow cavities, with the cooling tube mats being located in the hollow cavities and the upper panels preferably being provided with a thermal barrier and/or a thermally reflecting layer, for example a foil of aluminium.

Likewise for the solution of this object provision is made in accordance with the invention, in a cooling ceiling of the initially named kind, in a second variant, that the carrier system consists of a plurality of dry building panels, in particular fire resistant dry building panels such as sandwich-type plaster board panels or gypsum fibre board panels, which are assembled together into an areal arrangement, in that the individual cooling tube mats arranged in groups or in a matrix form are accommodated beneath the surface formed by the dry building panels, or in cut-outs within the dry building panels, and are optionally carried by the latter, with the cooling tube sections of the cooling

tube mats which extend parallel to one another being embedded, at least in their upper regions, in a material which fills out the hollow cavities between the tubes, or being at least partly accommodated in grooves in the lower side of the dry building panels, with the grooves having a cross-sectional shape complementary to the cross-sectional shape of the upper side of the tubes, and wherein the connections to the cooling tube mats are led upwardly and are connectable to one another above the dry building panels and are connectable to outflow and supply tubes for the liquid coolant.

The cooling ceiling of the invention is thus a construction which can be manufactured in dry building manner. It is assembled from building elements which are known per se and which are available at a favourable price in sizes which are easy to handle. Thus the building progress is not impaired by the installation of a cooling ceiling. This installation is in principle no more complicated than the installation of a normal built-in ceiling.

Since this is a dry method of construction, there are hardly any restrictions with respect to lighting and installation. Cables can be laid loosely on the upper side of the ceiling or in open cable channels and can be led through the cooling ceiling at positions where no cooling mats are present. When using fire resistant dry building panels, in particular sandwich-type plaster board or gypsum fibre panels no difficulties exists in achieving a fire protection of F 30. Moreover these panels can be straightforwardly provided with acoustic plaster, wallpaper or coats of paint, particularly since no transitions are visible.

Through the more flexible suspension of the cooling ceiling up to 10 % of the calculated cooling mats can spared since, for example, the finished ceiling height can be calculated individually for each room.

Particularly preferred embodiments of the acoustic insulation can be seen from the claims 2, 3 and 4.

In accordance with claim 5 provision is made for the cooling ceiling to consist of premanufactured elements which are assembled to form the finished ceiling. This can be realized by at least two different routes. On the one hand the possibility exists, in accordance with claim 6, that each element consists of an upper dry building panel and a lower dry building panel and at least two preferably bar-like spacers, and also preferably of a thermal barrier and a sound insulation. These elements can then be installed alongside one another in a grid-like manner in accordance with the further patent claims 7 to 10 in order to produce the full cooling ceiling. The hollow cavities also enable a connection of the tubes or cooling mats to one another as desired in series or in parallel. After the installation of the individual elements the joints between the individual elements can if desired be filled in or stuck over or - as a feature of the design of the ceiling - also left freely visible as a partitioning pattern.

Alternatively the cooling ceiling can be build-up of the following elements in accordance with claim 11:

a) of upper dry building panels with a thermal barrier secured thereto, for example in the form of aluminium foil, with the thermal barrier preferably being attached to the lower side of the upper dry building panels,

b) of spacers which are attachable to the lower side of the upper dry building panels, which are optionally already attached to the upper panels during their manufacture,

c) of lower dry building panels which are attachable to the spacers in order to form the hollow cavities which receive the cooling tube mats, and

d) optionally a sound insulation, preferably in the form of a sound insulating fleece which is either attachable between the spacers and the upper side of the lower panels or is attachable in the manner of a wallpaper to the lower side of the lower panels.

In this way a light manner of construction is achieved. For example, after completion of the hanger construction and the attachment of CD sections to the individual hangers the upper panels can be attached to the CD sections by means of rapid construction screws. The aluminium foil, which is preferably provided, is preferably previously laminated onto the lower sides of the upper panels. This can, however, optionally take place after the mounting of the upper panels. Then the bars, for example in the form of plaster bars which are available at a favourable price and

which are intended to serve as spacers, are secured to the upper panels by means of further rapid construction screws. Thereafter the cooling mats are inserted into the hollow cavities between the bars and are held in the so-formed hollow cavities by the attachment of the lower dry building panels, with the lower dry building panels likewise being secured by means of rapid construction screws at the positions of the spacers and with the rapid building screws being able to pass both through the plaster bars as well as through the upper dry building panels and optionally the CD sections of the carrier system. Thereafter it is only necessary, if desired, to fill in or tape over the gaps between the lower dry building panels. If desired an acoustically insulating fleece can be provided at the upper side of the lower dry building panels or can be attached in the form of a wallpaper to the lower side of the lower dry building panels.

Particularly preferred embodiments of this design can be found in the claims 12 to 15.

A cooling ceiling of a second variant of the invention, in which the tubes of the cooling tube mats are embedded in a material, has the special advantage that the embedding material on the one hand represents an insulation towards the top, so that the cooling tube mats can be accommodated in cut-outs of the surface without upper dry building panels without having to fear a pronounced cooling loss upwardly. Moreover, with a construction of this kind a ceiling is produced which has essentially only the thickness of one dry building panel, even when the cooling tube mats have an increased thickness in order to obtain better insulation, with the weight of the ceiling construction being relatively small. The lower side of the cooling ceiling then presents itself either as a continuous closed surface (after the closing of the transitions between the dry building panels and between the dry building panels and the cooling tube mats, which in the manner previously known for dry building panels can take place by means of tapes and optionally with a filler composition), and this ceiling can if required be painted or papered or provided with a coating, for example of a glass fabric and/or of spray plaster. The cooling tubes can, if desired, have a flattened surface of the bottom which ensures a better cooling action downwardly and moreover enables a flat design of the lower side of the cooling ceiling, or they can, for example, have a circular or polygonal cross-section which is only embedded up to a half height in the embedding material, with the downwardly projection regions of the cooling tubes taking care of a decorative structuring of the lower side of the cooling ceiling, i.e. being capable of being used as a design feature. This variant has, however, also the advantage that the exposed surface of the cooling tubes is even larger relative to the flattened version, whereby the cooling action is increased still further. This increase of the cooling action signifies in turn that one can operate with lower temperature differences - whereby the danger of condensation is reduced - and/or can operate with a lower flow speed of the coolant, whereby the flow noises are reduced.

Since the upper sides of the tubes and of the cooling mats are embedded in the embedding material an air circulation cannot take place here, so that the danger of the formation of condensation in this area is small.

In arrangements, in which the cooling tubes are not covered over towards the bottom - or are at most covered with a paint layer or a thin coating - the danger of condensation is in any event low, because the normal air circulation at relatively low temperature differences prevents the formation of condensation.

These advantages can also be achieved when the cooling tube mats are attached beneath the dry building panels and for example adhesively bonded to them. When embedding the cooling tubes and the cooling tube mats in an embedding material the arrangement can be bonded over the full area or only locally to the dry building panels or, for example, rapid construction screws at specific points can also serve for an attachment.

If the cooling tube mats consist solely of tubes arranged parallel to one another which are arranged in grooves in the lower side of the dry building panels then a bonded arrangement can also be effected in these grooves.

It is however also possible to accommodate the cooling tube mats between two layers of dry building panels in a sandwich construction. In this case the cooling tube mats with embedding material are arranged in shallow hollow cavities between upper and lower dry building panels and fully fill out these low cavities. Alternatively cooling tube mats formed simply from cooling tubes arranged parallel to one another can be so arranged that the tubes are arranged in grooves formed in the upper and/or lower dry building panels, with the tubes preferably fully filling out these grooves in order to largely avoid air movements in this region and thus the formation of condensation.

Preferred further embodiments of the second variant of the invention can be found in the subordinate claims.

An element for use in the manufacture of a cooling ceiling construction can be found in claim 17. Finally the claims 18 and 19 are concerned with two variants of cooling tube mats which are likewise suitable for use in a cooling ceiling in accordance with the invention. In accordance with claim 18 the thermal barrier is provided at the upper side of the cooling tube mat and in accordance with claim 19 the sound insulation is located on the lower side of the cooling tube mat. I.e. these two preferably provided components of the cooling ceiling of the invention are already delivered with the cooling tube mats and form with these cooling tube mats a constructional unit which is then inserted into the hollow cavities provided.

The invention will be explained in the following in more detail with reference to embodiments and to the drawing in which are shown:

Fig. 1 a schematic cross-section through a first embodiment of the invention,

Fig. 2 a schematic cross-section through a second embodiment of the invention,

Fig. 3 a schematic cross-section through a cooling tube mat in accordance with the invention,

Fig. 4 a schematic plan view of two variants of the cooling ceiling in accordance with the invention and indeed a plan view from above, not from below,

Fig. 5 a section in accordance with the arrow V-V of Fig. 4,

Fig. 6 a section in accordance with the arrow VI-VI of Fig. 4,

Fig. 7 a modified variant of the embodiment of Fig. 5,

Fig. 8 a modified variant of the embodiment of Fig. 6,

Fig. 9 a further modified variant of the embodiment of Fig. 5,

Fig. 10 a further modified embodiment of the variant of Fig. 6,

Fig. 11 a further variant of a cooling ceiling in accordance with the invention,

Fig. 12 a yet further variant of a cooling ceiling in accordance with the invention, and

Fig. 13 a further development of the embodiment of Fig. 5.

Fig. 1 shows a part cross-section through a cooling ceiling 10, which is executed in this example as a suspended ceiling. For this hangers 12 are provided which can be secured to a bare ceiling or to an old ceiling. Below these hangers there are located so-called CD sections 14 which serve as carrier rails and which are well known per se, as also are the hangers. In this example the spacing (center-to-center spacing) D from carrier rail to carrier rail amounts to a maximum of 625 mm. Sandwich-type plaster board panels 16 with dimensions of 2000 mm length, 1250 mm width and 12.5 mm thickness are secured to the CD ceiling sections 14 from below with the aid of rapid construction screws 18. These have, for example, a length of 25 mm. The invention is not restricted to these preferred dimensions, as quoted. Boards with other dimensions can be used, for example, board thicknesses in the customary range from 9.5 mm to 18 mm can be straightforwardly selected.

An aluminium foil 20 is secured to the lower side of the boarding formed by the sandwich-type plaster board panels 16 and is self-adhesively overlapped at the longitudinal joints.

This aluminium foil acts as a thermal barrier, but also as a vapor barrier in accordance with the invention.

Spacers 22 are arranged beneath the aluminium foil with a clear spacing of a maximum of 50 cm and this attachment can be achieved by adhesive bonding or by rapid construction screws 23. In the latter case the rapid construction screws are screwed through the spacers into the upper sandwich-type plaster board panels 16 and, if desired, also into the CD sections. The spacers are realized here in the form of long strips of sandwich-type plaster board panels or strips of gypsum fibre board panels (simply named plaster bars in the following), which are arranged parallel to one another. It would also be conceivable to use shorter plaster bars which should then be laid out at the node points of a square pattern. The use of longer bars is however preferred because this facilitates the attachment of the lower sandwich-type plaster board panels.

Hollow spaces 24 are formed between the plaster bars 22 and beneath the sandwich-type plaster board panels 16, i.e. beneath the aluminium foil 20, in which cooling tube mats can be received (not shown in Fig. 1). These cooling tube mats, which preferably consist of plastic, are commercially available and are in this example provisionally secured in the hollow spaces 24 during the insulation of the cooling mats and indeed by means of a two-sided adhesive tape. After attachment of the plaster bars 22 and the cooling mats a second boarding, likewise consisting of sandwich-type plaster board panels 26 with dimensions of 2000 mm length, 1250 mm width and 12.5 mm thickness are secured with the aid of rapid construction screws at the positions of the plaster bars 22. These dimensions are also only preferably quoted here. A sound insulating fleece 32 of 2 mm thickness is located on these lower sandwich-type plaster boards 26, preferably on the top side, and can for example be adhesively bonded to the sandwich-type plaster boards 26 for example at the construction site, and causes the introduced cooling tube mats to directly contact the first boarding, i.e. the aluminium foil 20. The sound insulating fleece presses against the lower side of the cooling tube mats and prevents free hollow cavities arising which could lead to refrigeration losses and vibrations at the ceiling. The joints 30 formed between the abutting panel sides of the lower sandwich-type plaster boards 26 are filled in with joint filling composition with the insertion of a joint tape, so that from the bottom a continuous ceiling is visible. As can be seen from Fig. 1 the lower panels 26 are offset by the half width relative to the upper panels. This is favourable with regard to the behaviour in the case of fire but is not however compulsory.

It should be emphasized that not every hollow space 24 has to be provided with a cooling tube mat, but rather some hollow spaces 24 can be left free and the lighting can be installed in these left free regions, for example in a regular pattern.

One notes that with the dimension selected here the rapid construction screws 27 which are used to secure the lower sandwich-type plaster boards 26 to the upper construction are screwed into the CD sections 14 and there directly secure the lower sandwich-type plaster boards to the CD sections. Plaster bars (not shown) can optionally be provided between them. The selected dimensions ensure in other respects that the spacers are preferably arranged at the positions of the CD sections and, with plaster bars of 125 mm width, each second plaster bar bridges the joint between two lower panels 26 and hollow spaces of 50 cm thereby arise, which are favourable for the mounting of the cooling tube mats. With the upper panels the joints between two respective adjacent panels are also bridged by the spacers, which turns out to be very favourable with respect to the behaviour in the case of fire.

In order to facilitate the fixing of the rapid construction screws the lower sandwich-type plaster boards 26 can be provided with corresponding markings at the positions for the rapid construction screws, for example by drawn-in lines or by a printed on template pattern.

In this example the plaster bars 22 can already be secured to the upper sandwich-type plaster board panels 16 at the manufacturers, with the aluminium foil then either being provided only between the bars or also being applied as a continuous foil to the lower side of the bars.

With this type of construction the cooling ceiling consists of the following elements:

a) of upper dry building panels 16 with a thermal barrier 20 secured thereto, for example in the form of aluminium foil (with the thermal barrier 20 preferably being attached to the lower side of the upper dry building panels),

b) of spacers 22 which are attachable to the lower side of the upper dry building panels 16, which are optionally already attached to the upper panels during their manufacture,

c) of lower dry building panels 26 which are attachable to the spacers 22 in order to form the hollow cavities 24 which receive the cooling tube mats 34, and

d) optionally a sound insulation 32, preferably in the form of a sound insulating fleece 32 which is either attachable between the spacers 22 at the upper side of the lower panels 26 or is attachable in the manner of a wallpaper to the lower side of the lower panel 26.

Fig. 2 shows an alternative embodiment of a cooling ceiling 10 in which the same parts are provided with the same reference numerals. Here the lower sandwich-type plaster board panels 26 are arranged in alignment with the upper sandwich-type plaster board panels 16 and in each case one upper sandwich-type plaster board panel and one lower sandwich-type plaster board panel forms an element by means of two spacers 22 and rapid construction screws 27. Here an aluminium foil as a thermal barrier is also provided on the lower side of the upper sandwich-type plaster board panel 16 and the sound insulation fleece 32 is provided as thermal insulation above the lower sandwich-type plaster board panel 26. In the hollow space 24 formed between the panels 16 and 26 there is located a cooling tube mat 34 which, in this element, is either placed into the hollow space 24 during manufacture prior to the attachment of the lower sandwich-type plaster board panel 26 or can also be pushed from the side into the hollow space after the completion of the element.

Since, in this example, an element consisting of two sandwich-type plaster board panels would threaten to be somewhat heavy and difficult to handle, the width dimension of the sandwich-type plaster board panels is halved so that the gaps between the individual elements in this example come to light precisely at the positions of the CD sections. The elements can however certainly have other dimensions and the arrangement of the hangers can be correspondingly selected.

The embodiment of Fig. 2 also shows that it is not absolutely essential to fill in the gap between the neighbouring elements. The gaps can also be left open in the manner of a shadow joint.

It is shown at 36 that the edges of the lower sandwich-type plaster board panels 26 can be chamfered in order to produce a pleasing optical pattern in a joint area.

In order to improve the behaviour in the case of fire the individual elements of this design can be formed with grooves at two sides and tongues at the other two sides, so that in the finished cooling ceiling each joint is bridged by a fire retarding tongue.

Finally Fig. 3 shows a cooling tube mat in accordance with the invention which is provided at the upper side with an aluminium layer, for example in the form of aluminium foil and at the lower side with a sound insulation, for example in the form of a sound insulating fleece 32.

Although the above described embodiments are principally described using sandwich-type plaster board panels which, at least in the constructional form of Fig. 1, allow a fire protection factor of F 30 to be achieved, other dry building panels can be straightforwardly used for example so-called gypsum fibre panels. The dimensions of the individual elements can also be selected as desired. Furthermore it is not essential that the mounting takes place via hangers and CD sections. The elements of the cooling ceiling can also be secured either directly to a bare ceiling or to an old ceiling or can be secured via a lath arrangement to such ceilings.

Further variants of the invention will be explained in the following with reference to the further Fig. 4 to 13.

As was brought to expression above Fig. 4 shows a plan view onto the top side of a cooling ceiling 10 and indeed in two different variants which are shown to the left and right in Fig. 4. The two curved parallel lines at the center of Fig. 2 which go from the top to the bottom represent a conceptual separation between the two variants. For both

variants upper dry building panels 16 are however laid alongside one another in accordance with a specific pattern. The dry building panels 16 are offset relative to one another in the individual rows in similar manner to a brick wall. The degree of the offset is not critical. Other patterns can however also be straightforwardly selected. The precise arrangement of the upper dry building panels 16 is not important. An arrangement should however be selected which straightforwardly enables the amounting of the dry building panels on CD ceiling sections for example. In order to fix the positions of the screws the panels can have markings, for example printed markings. In Fig. 4 curved lines are also used in order to characterize dry construction panels 16' which have been broken away for the purpose of the illustration.

At the left hand side of Fig. 4 there is a group of a total of eight cooling tube mats 34 combined into an elongate group. These cooling tube mats are arranged beneath the dry construction panels, which is why the side edges are simply shown with broken lines. This is not possible for each side of the cooling tube mats of the series at the right hand side because the corresponding sides of the cooling tube mats lie beneath the joints between adjacent dry construction panel 16.

A supply tube and a discharge tube are shown by the reference numerals 40 and 42. It can be seen from the illustration at the left in Fig. 4 that the connection 44 of the uppermost cooling tube mat 44 in Fig. 4 is connected to the supply tube 40 while the discharge connection 46 of the same cooling tube mat is connected to the supply connection 44 of the lower lying cooling tube mat. This type of cross connection repeats for all the cooling tube mats and to the lowest cooling tube mat 34 in Fig. 4 the discharge connection 46 of which is connected to the discharge tube 42.

The arrangement shown indicates that the cooling tubes of the individual cooling tube mats 34 are led in narrow loops within the individual cooling tube mats. It is however also possible to arrange a distributor tube at two ends of each cooling tube mat, with the cooling tubes then extending strictly parallel to one another between the distributor tubes.

An alternative arrangement of the cooling tube mat is shown at the right hand side of Fig. 4. Here these are namely provided within cut-outs 50 between the dry construction panels. In this case the supply connections 44 and the discharge connections 46 of the individual cooling tube mats are visible. It can also be seen here that the series of cooling tube mats 34 is connected to the supply tube 40 and to the discharge tube 42.

After the explanation of the two different basic arrangements at the left and right hand side of Fig. 4 both basic arrangements will be explained in more detail and various variants will be explained with reference to the further Figures.

In all Figures the same reference numerals also indicate the same parts. In some Figures individual parts have been omitted in order to simplify the illustration.

Fig. 5 shows a section through the arrangement at the left hand side of Fig. 4, and indeed in accordance with the section plane V-V. Two parts of two neighbouring upper dry construction panels 16 are evident from Fig. 5 as well as the cooling tube mat 34 arranged beneath them. In this section drawing the individual tubes 42 of the cooling tube mats can also be recognized. It can also be seen that the cooling tubes 52 of the cooling tube mats are embedded in an embedding material 54 and that the so-formed cooling tube mat has a regular rectangular shallow cross-section. The embedding material can either be a plastic material with closed pores or can also be a gypsum composition or a gypsum fibre composition. In both cases the embedding material leads to an insulation which is effective in a upward direction.

Fig. 6 shows the corresponding arrangement at the right hand side of Fig. 4 where the cooling tube mat 34 is arranged in a cut-out 50 in the surface of the upper dry construction panel 16. The cooling tube mat 34 is, in this example, identical to the cooling tube mat of the embodiment of Fig. 5. It is evident that in both the embodiment of Fig. 5 and also the embodiment of Fig. 6 the cooling tubes have a circular cross-section and are fully embedded in the embedding material 54, with them however being arranged at the lower boundary of the embedding material 54. The cooling action downwardly is however improved relative to a possible such arrangement in which the cooling

tubes 52 are arranged at the middle or in the top region of the embedding of the material 54.

An even better cooling action results from the two embodiments of Figs. 7 and 8. In the embodiment of Fig. 7 the cooling tube mat 34 is again located beneath the upper dry construction board 16 and can for example be adhesively bonded to the latter. The adhesive bond is easily possible since the embedding material 54 has a smooth surface and the adhesive can be applied in strips, pointwise or over the full area. The special feature of this embodiment is the fact that the cooling tubes 52 have, in this example, a downwardly flattened - specifically a D-shaped - cross-section so that a substantially larger area of the cooling tubes is arranged at the lower boundary of the cooling ceiling. In this way the cooling performance is improved.

In the embodiment of Fig. 7 the cooling tube mats 34 project downwardly with respect to the dry construction panel 16, this does not, however, have to be disturbing, but can rather represent a design feature of the ceiling, and indeed in particular when the cooling tube mats are laid out in accordance with a special pattern in order to produce special contrast effects.

Fig. 8 shows the cooling tube mat 34 of Fig. 7 with the cooling tubes having a D-shaped cross-section, which are arranged in a cut-out 50 of the upper dry construction panels, i.e. as shown in Fig. 6. The broken line 56 in Fig. 8 gives expression to the fact that the thickness of the embedding material can be increased in order to achieve a better insulation of the cooling tube mats in the upward direction.

Figs. 9 and 10 show a further alternative of the cooling tube mat 34 in which the cooling tubes 52 indeed again have a circular cross-section but are only embedded up to half the height in the embedding material 54. Since an even larger surface of the cooling tube mat projects out from the lower side an even better cooling performance is achievable than with the corresponding embodiment of the previous Figs. 7 and 8.

Fig. 10 shows a further alternative in which an aluminium foil is applied onto the upper surface of the embedding material 54 which further reduced the extent of the cooling flux in the upper direction. The aluminium foil 58 can be a simple aluminium foil but can also be a laminated aluminium foil or an aluminium foil with threads or grid-like reinforcing elements. An arrangement of this kind improves the holding together and also the ability to handle the cooling tube mats 34, which already represent a stable handleable arrangement as a result of the embedding material.

Fig. 11 shows a somewhat different variant in which the cooling tube mat consists in principle only of the cooling tubes 52 with the tubes 52 extending strictly parallel to one another and come to lie in grooves in the lower side of the upper dry construction panels 16 and in the upper side of the lower dry construction panels 26. In this way the tubes - as in some of the other embodiments - are fully "embedded" so that no air flows enter into the region of the cooling tubes and the formation of condensation is largely suppressed.

Fig. 12 shows an arrangement which is in principle similar to the arrangement of Figs. 1 and 2 of the present application. Here the cooling tube mat 34 is again accommodated in a hollow space between upper and lower dry construction panels 16 and 26, with the hollow space being formed by spacers 22. Interesting in this embodiment is the fact that the embedding material 54 prevents the entry of air into the region of the cooling tube mat 34 and thus also offers an effective protection against condensation.

Fig. 12 shows a yet further variant in which holes or openings 60 are provided in the lower dry construction panels 26 which extend up to the cooling tube mat. In this manner a good cooling action can be achieved. Although not shown in Fig. 12 the hole 60 can be provided in a regular pattern in the lower dry construction panels 26 or can merely be provided sectionwise, as is for example shown in Fig. 12.

Fig. 13 shows an arrangement which is very similar to the embodiment of Fig. 5 but in which a distinction however lies in the fact that further dry construction panels 26 are arranged around the cooling tube mat 34. In this way a continuous lower surface is formed which is suitable for being provided with a covering 60. This covering 60 can simply represent a coat of paint, but can, however, also be a wallpaper or a glass fibre fabric and/or a layer of a so-called spray plaster.

Although the cooling tubes 52 have a circular cross-section in this embodiment, D-shaped cooling tubes in accordance with Fig. 7 can also be used, for example.

Yet another variant is shown in Fig. 13. An aluminium foil 58 is located above the cooling tube mat and is laid out in a manner which is explained in connection with Fig. 10. As an alternative to the embodiment of Fig. 10 the aluminium layer 58 can however here be provided on the lower side of the upper dry construction panel 16 - instead of on the cooling tube mat 34 - or can indeed be provided loosely between the cooling tube mat 34 and the lower side of the upper dry construction panel 16.

The variants of Figs. 4 to 13 can be secured in the same way and means to ceilings as is described in conjunction with the embodiment of Figs. 1 to 3.

ARTicle 34

Claims

1. Cooling ceiling (10) comprising cooling tube mats (34), which are attached or attachable by means of a carrying system (12, 14) to a bare ceiling or to an existing ceiling, wherein the cooling tubes are arranged inside a sandwich construction with upper and lower fire resistant dry building panels (16, 26), such as sandwich-type plaster board panels or gypsum fibre board panels and also spacers located between the dry building panels, wherein the upper panels (16) are optionally provided with a thermal barrier (20), for example a foil of aluminium, characterized in that the cooling tubes are provided in the form of cooling tube mats, which can be connected together and arranged in shallow hollow cavities (24), which are formed by the spacers (22) between the upper and lower dry building panels (16, 26).

2. Cooling ceiling (10) in accordance with claim 2, characterized in that a sound insulating fleece (32) is arranged beneath the cooling tube mat (34) on the upper side of the lower dry building panels (26).

3. Cooling ceiling (10) in accordance with one of the preceding claims, characterized in that it is assembled from premanufactured elements (16, 22, 26).

4. Cooling ceiling (10) in accordance with claim 3, characterized in that the elements which receive the cooling tube mats in hollow cavities (24) each comprise an upper dry building panel (16), a lower dry building panel (26) and at least two preferably bar-like spacers (22).

5. Cooling ceiling (10) in accordance with claim 4, characterized in that, with a ceiling which is put together from the named elements, not every hollow cavity is provided with a cooling tube mat (34).

6. Cooling ceiling (10) in accordance with one of the preceding claims, characterized in that the attachment of the upper and lower panels (16, 26) to one another takes place at positions at which spaces (22) are provided.

7. Cooling ceiling (10) in accordance with claim 6, characterized in that the upper panels (16) are either directly mounted on the upper ceiling or to a lath arrangement or to hangers (12) or preferably to so-called CD-sections (14) carried by corresponding hangers, which have a maximum spacing (center-to-center spacing) of 625 mm.

8. Cooling ceiling (10) in accordance with claim 7, characterized in that the upper panel (16) are sandwich-type plaster boards which have a length of 2000 mm, a width of 1250 mm and a thickness of 12.5 mm.

9. Cooling ceiling (10) in accordance with one of the claims 7 to 8, characterized in that the spacers (22) are plaster bars with a width of approximately 12.5 cm and a thickness of approximately 6 mm, with the plaster bars being arranged with a clear spacing of 50 cm maximum.

10. Cooling ceiling (10) in accordance with one of the claims 7 to 9, characterized in that the lower panels (26) are sandwich-type plaster boards which preferably have a length of 2000 mm, a width of 1250 mm and a thickness of 12.5 mm.

11. Cooling ceiling (10) in accordance with claim 2 and one of the claims 7 to 10, characterized in that the sound insulating fleece (32) has a thickness of 2 mm.

FIG. 2

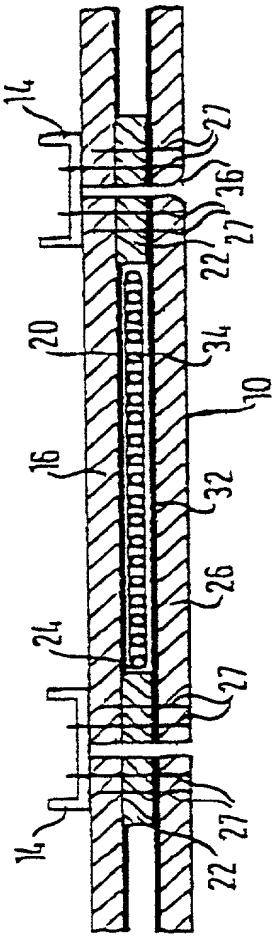


FIG. 3

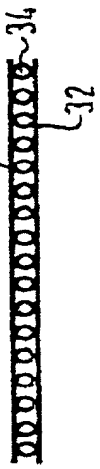


FIG. 1

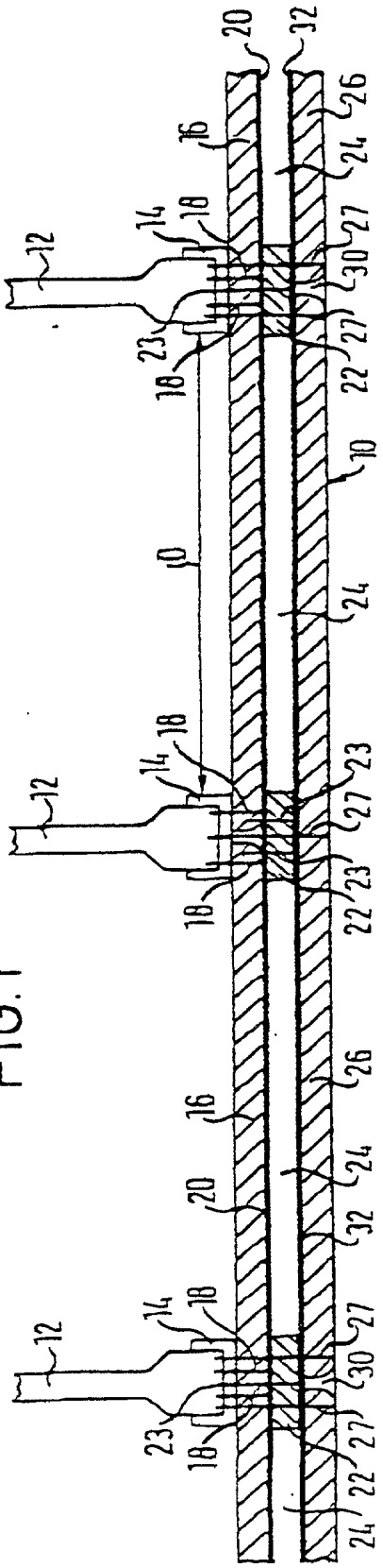


FIG. 4

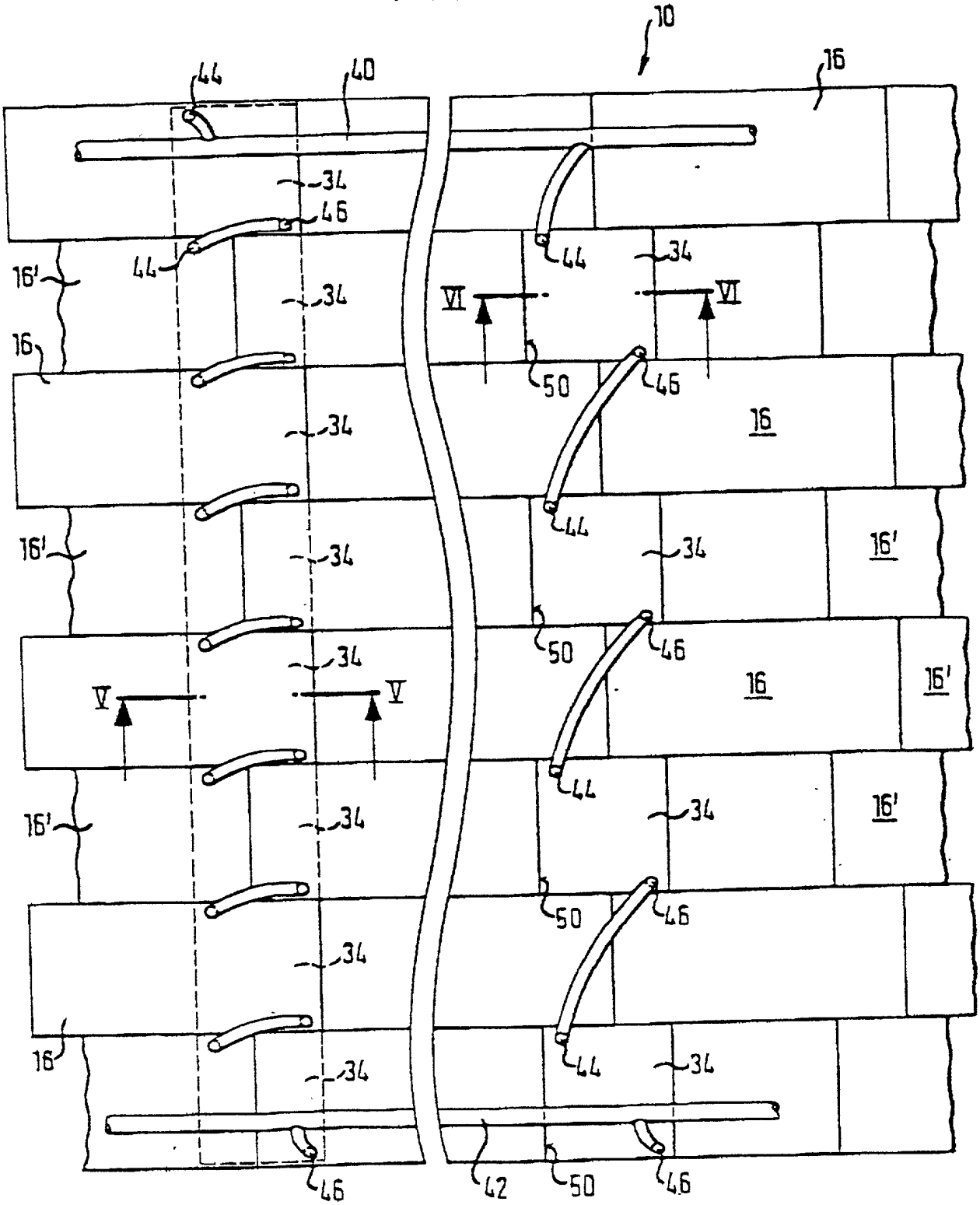


FIG. 5

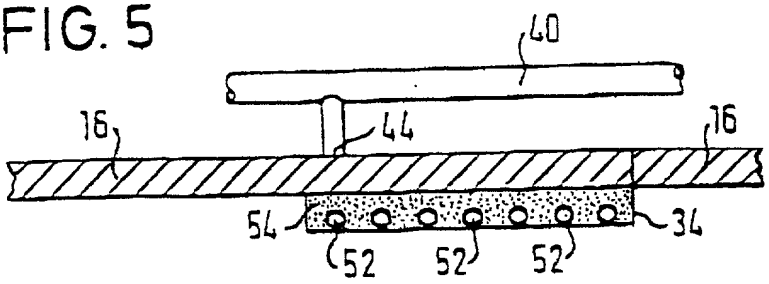


FIG. 6

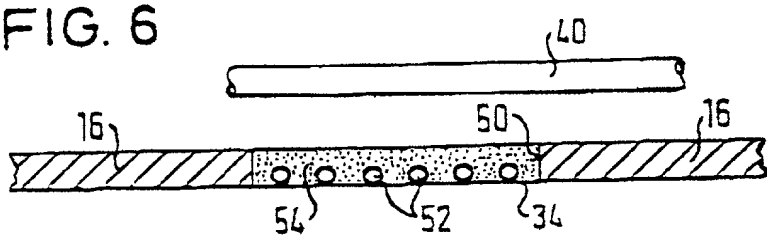


FIG. 7

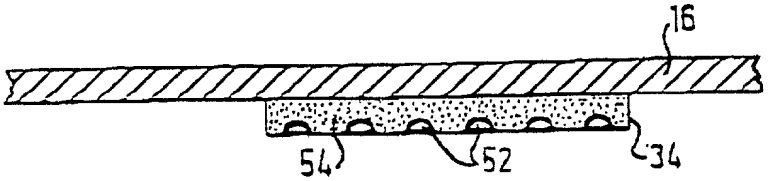


FIG. 8

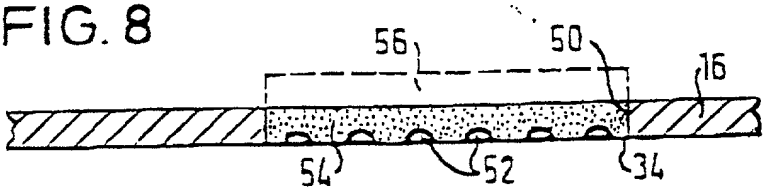


FIG. 9

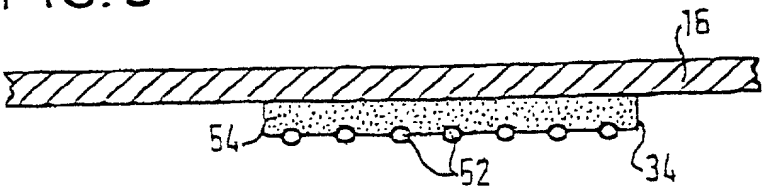


FIG. 10

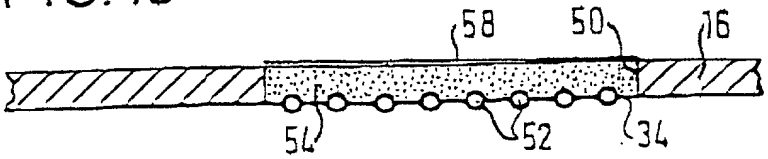


FIG. 11

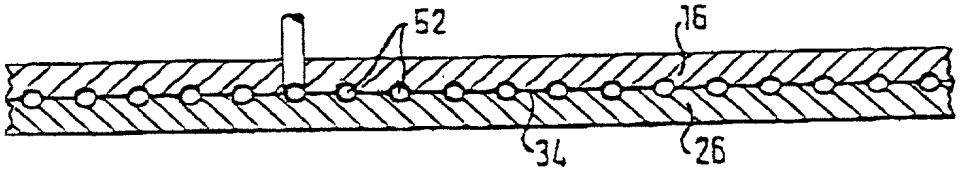


FIG. 12

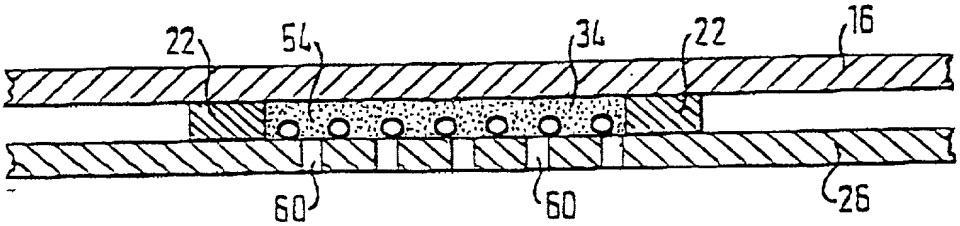
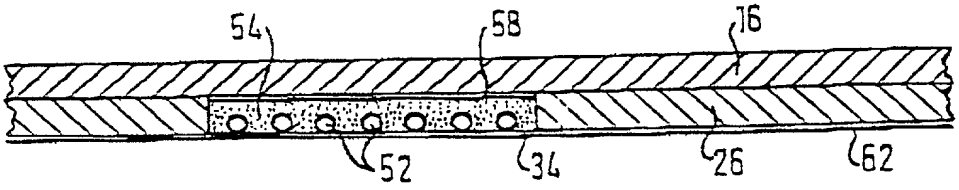


FIG. 13



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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	88724
First Named Inventor	Reiner Weber
COMPLETE IF KNOWN	
Application Number	09 /254,743
Filing Date	March 11, 1999
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

COOLING COVER, COOLING COVER COMPONENTS AND COOLING TUBULAR ARMATURE

(Title of the Invention)

the specification of which
☐ is attached hereto
OR
☒ was filed on (MM/DD/YYYY) 9/11/97 as United States Application Number or PCT International Application Number PCT/EP97/04987 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
19636944.4	Germany	9/11/96	☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number *(if applicable)*

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OR

☒ Registered practitioner(s) name/registration number listed below

Name	Registration Number	Name	Registration Number
J. Georg Seka	24,491	Chun-Pok Leung	41,405
James F. Hann	29,719		
Charles E. Krueger	30,077		
Kevin T. LeMond	35,933		

(5)

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] *OR* ☐ Correspondence address below

Name	J. Georg Seka				
Address	Townsend and Townsend and Crew LLP				
Address	Two Embarcadero Center, 8th Fl.				
City	San Francisco	State	CA	ZIP	94111
Country	US	Telephone	415-576-0200	Fax	415-576-0300

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle if any)	Family Name or Surname
Reiner	Weber

Inventor's Signature						Date	14/5/99
Residence: City	Neuoetting	State		Country	Germany	Citizenship	DE
Post Office Address	Karl-Valentin-Strasse 20						
Post Office Address							
City	Neuoetting	State		ZIP	D-84624	Country	Germany

DEX

☒ Additional inventors are being named on the 1 supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

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DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet
Page 1 of 1

Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])		Family Name or Surname				
Michael		Schwendemann				
Inventor's Signature					**Date**	13.5.98
Residence: City	Kolbermoor	**State**		**Country**	Germany	**Citizenship**	DE
Post Office Address	Sudetenstrasse 8a					
Post Office Address						
City	Kolbermoor	**State**		**ZIP**	D-83059	**Country**	Germany

Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])		Family Name or Surname				
Inventor's Signature					**Date**	
Residence: City		**State**		**Country**		**Citizenship**	
Post Office Address						
Post Office Address						
City		**State**		**ZIP**		**Country**	

Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])		Family Name or Surname				
Inventor's Signature					**Date**	
Residence: City		**State**		**Country**		**Citizenship**	
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City		**State**		**ZIP**		**Country**	

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